Submission Title:

Estimates of Future Numerical Weather Prediction Impacts from Hyperspectral Sounders

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Abstract

The United States' satellite programs are currently in the process of evaluating the future of satellite observations of the Earth's atmosphere, both as an individual nation and within the context of international partnerships. In an effort to better understand the impacts of various alternatives, the Global Modeling and Assimilation Office (GMAO) observing system simulation experiment (OSSE) framework has been utilized to evaluate several configurations of the international hyperspectral infrared sounder constellation from the perspective of global numerical weather prediction (NWP). This was done with an emphasis on the proposed NOAA/NASA Geostationary eXtended Observations (GeoXO) Sounder (GXS), planned to launch in the mid-2030s, and similar planned missions from international partners. GXS, in addition to contributions from EUMETSAT and JMA, will form a global ring of geostationary sounders consistent with the WMO's 2040 vision. In addition to a novel geostationary IR sounder program, considerations extend to the future of the Low Earth Orbit (LEO) sounder program with the upcoming demise of several existing instruments and plans for future missions ongoing. The GMAO OSSE framework has examined the potential roles of GEO and LEO sounders in weather prediction improvement. Overall, the inclusion of both GEO sounders in a global ring and LEO sounders produces the most beneficial observation impact and the most accurate global weather forecasts as evaluated using several metrics, including hurricanes and the FSOI.